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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/835,820	04/17/2001	Tomohisa Hoshino	P 280192 EL00028CDC	5539

909 7590 07/01/2002

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4/17/00

EXAMINER

LUU, CHUONG A

ART UNIT	PAPER NUMBER
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2825

DATE MAILED: 07/01/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/835,820

Applicant(s)

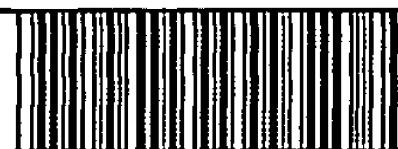
HOSHINO et al.

Examiner

Chuong Luu
Calvin Lee

Art Unit

2825



-- The MAILING DATE of this communication appears on the cover sheet with the corresponding address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on Apr 16, 2002
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1035 C.D. 11; 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-16 is/are pending in the application.
- 4a) Of the above, claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 8-14 is/are allowed.
- 6) ☒ Claim(s) 1, 3-7, 15, and 16 is/are rejected.
- 7) ☒ Claim(s) 2 is/are objected to.
- 8) ☐ Claims _____ are subject to restriction and/or election requirements.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- *See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- | | |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s). _____ | 6) <input type="checkbox"/> Other: |

OFFICE ACTION

Response to Amendment

1. The addition of claims 15-16 in Paper 7 received April 16, 2002 is acknowledged.

Claim Rejections - 35 USC § 102

2. Claims 1, -7, 15, and 16 are rejected under 35 U.S.C.102(b) as being anticipated by *Lee at al.* (US 5,665,659).

Lee discloses a method of fabricating a semiconductor device, comprising the steps of:

- forming a barrier layer 67 on an insulating film 65 covering a substrate 61 [Fig.7];
- exposing the barrier layer to a nitrogen atmosphere at a temperature of 250-500°C;
- forming a copper film 69 on the barrier conductor layer [col. 7]
- exposing film 69 to a reducing gas atmosphere of hydrogen or nitrogen at 250-500°C [col. 7, line 62 through col. 8, line 13];

Since *Lee* suggests exposing the barrier to a nitrogen atmosphere, *Lee* inherently teaches or suggests exposing to a reducing atmosphere. The nitrogen gas, which is used in *Lee*'s exposing step, reads on the claimed reducing gas.

Claim Rejections - 35 USC § 103

3. Claim 7 is rejected under 35 U.S.C.103(a) as being unpatentable over *Lee at al.* in view of *Kajita* (US 5,953,634).

Lee is silent about the barrier layer comprised of tungsten nitride or tantalum nitride. Nevertheless, such barrier layer's material is known in the semiconductor processing art as

evidenced by *Kajita* disclosing a barrier conductive layer formed of tantalum nitride or tungsten nitride by a CVD process [col. 11, line 66 through col. 12, line 3].

It would have been obvious to one having skills in the art to have modified the barrier material of *Lee* by utilizing tungsten nitride instead because tungsten is a lot durable than titanium

Allowable Subject Matter

4. Claim 2 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.
5. Claims 8-14 are allowed because none of the above references teaches or suggests exposing the barrier conductive layer to a plasma of a reducing gas.

Response to Arguments

6. Applicants argued that “the [Lee] reference does not suggests exposing to a reducing atmosphere. Examiner notes that the nitrogen gas, which is used in *Lee*’s exposing step, reads on the claimed gas. Therefore, *Lee* inherently teaches or suggests exposing to a reducing atmosphere

Applicants’ arguments that “Akahori is silent about formation of a metal film on a barrier film by a CVD process”, “Buchwalter merely teaches the use of a plasma treatment of a thin Cu layer to form an inorganic barrier layer...is thus insulative and is totally different from the conductive barrier layer...Buchwalter appears to be irrelevant to claim 8” are persuasive.

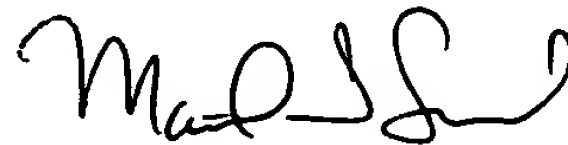
However, note in the rejection above, that the specific portions of *Lee* in view of *Kajita*, relied upon by the Examiner to reject the claims.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Chuong A Luu whose telephone number is (703)3050129. The examiner can normally be reached on M-F (7:30-4:00).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew Smith can be reached on (703)308-1323. The fax phone numbers for the organization where this application or proceeding is assigned are (703)308-7722 for regular communications and (703)308-7722 for After Final communications.

June 30, 2002

CAL



MATTHEW SMITH
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800